African Journal of Emergency Medicine (2013) **3**, 157–163

African Federation for Emergency Medicine

African Journal of Emergency Medicine

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Undergraduate emergency medicine in an African medical school – Experiences from Botswana

Les étudiants en médecine d'urgence dans les écoles de médecines africaines: les expériences du Botswana

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Received 19 January 2013; revised 8 April 2013; accepted 12 April 2013
Available online 29 May 2013

KEYWORDS

Undergraduate;
Emergency Medicine;
Botswana;
Education

Abstract *Introduction:* In August 2011, the first cohort of students at the University of Botswana School of Medicine (UBSOM) began their third year of undergraduate medical training. As part of their 2011–2012 curriculum they each completed a 10 week rotation in Emergency Medicine (EM), involving problem based learning (PBL) sessions, maintenance of log books, case presentations, and clinical time at the Emergency Centre (EC) of the main tertiary referral hospital in Gaborone, Princess Marina Hospital.

Methods: Since EM rotations are often undertaken in the final year of medical training, students were given an anonymous voluntary survey to study the effect of an EM experience in their first clinical year of training. A 5-point Likert scale was used to evaluate learning opportunities and the overall EM experience. Students described which procedures they had observed or performed in their rotation. The survey concluded with open-ended questions seeking additional feedback.

Results: These were very encouraging for both early exposure to EM and the PBL approach. More than 90% of students agreed or strongly agreed that they felt more confident in clinical settings,

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Peer review under responsibility of African Federation for Emergency Medicine.

Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.afjem.2013.04.003

improved their clinical decision making process, and found the PBL model to be effective over the rotation. 22 different procedures were observed in the EC with 100% observing venesection and plaster applications. 14 different procedures were performed with 83% students performing venesection and over 65% performing chest compressions and venous cannulation.
Discussion: It is hoped that this study will provide valuable practical information about undergraduate EM learning in a PBL based Medical School within Sub Saharan Africa that can be replicated across other medical education institutions throughout the region.

Abstract *Introduction:* En août 2011, la première cohorte d'étudiants à l'école de médecine de l'université du Botswana (UBSOM) a entamé sa troisième année d'études en médecine. Dans le cadre du programme 2011–2012, chacun des étudiants a effectué un stage de 10 semaines en médecine d'urgence, en suivant des sessions d'apprentissage par résolution de problèmes (ARP), ce stage leur permettant de se familiariser avec la tenue de journaux, les présentations de cas et de passer du temps aux urgences du principal hôpital tertiaire de référence de Gaborone, l'hôpital Princess Marina.
Méthodes: Les stages en médecine d'urgence étant souvent réalisés au cours de la dernière année des études en médecine, les étudiants ont participé à une enquête volontaire et anonyme afin d'étudier l'effet d'une expérience en médecine d'urgence au cours de leur première année de formation. Une échelle de Likert en cinq points a été utilisée afin d'évaluer les opportunités d'apprentissage et l'expérience générale en matière de médecine d'urgence. Les étudiants ont décrit les procédures qu'ils avaient observées ou réalisées au cours de leur stage. L'enquête s'achevait sur des questions ouvertes dans l'objectif de recueillir des commentaires supplémentaires.
Résultats: Les résultats se sont révélés encourageants tant en termes d'exposition précoce aux services d'urgence qu'en termes d'approche par ARP. Plus de 90% des étudiants affirmaient avoir davantage confiance en eux dans un environnement médical, que cela avait amélioré leur processus de prise de décision sur le plan médical, et trouvaient que le modèle d'ARP était efficace dans le cadre du stage. Les étudiants ont pu observer la réalisation de 22 procédures aux urgences, 100% d'entre eux ayant pu assister à une phlébotomie et à la pose d'un plâtre. Quatorze procédures différentes ont été réalisées, 83% des étudiants ont pu réaliser une phlébotomie et plus de 65% ont réalisé une compression thoracique et ont posé une voie veineuse.
Discussion: On espère que cette étude fournira des informations pratiques précieuses sur les étudiants en médecine d'urgence dans une école de médecine basée sur l'ARP en Afrique subsaharienne, qu'il sera possible de reproduire dans d'autres institutions d'enseignement de la médecine dans la région.

African relevance

- This paper describes an African Medical School undergraduate curriculum that includes emergency medicine.
- All African medical students can benefit from emergency medicine training.
- Feedback provided by students on their emergency medicine experience help improve the curriculum.

What is new?

- Problem based learning model utilized to design emergency medicine curriculum in Botswana.
- Early emergency medicine clinical exposure for medical students is beneficial.
- Medical students respond positively to emergency medicine key concepts and scope of practice.

Introduction

The University of Botswana founded the country's first medical school in 2009. In 2011–12, the first cohort of 36 medical students, during their third year of study, completed a 10-week rotation in Emergency Medicine (EM). Their first 2 years of undergraduate study were focused on basic medical sciences, so this third year marked their transition to study in a clinical setting. The students were split into groups of 9 and completed rotations in emergency medicine, internal medicine, paediatrics, and family medicine. During their EM rotation, they were supervised by EM specialists and residents at Princess Marina Hospital Emergency Centre (EC) – the major referral Hospital in the capital city, Gaborone.

The University of Botswana School of Medicine (UBSOM) curriculum follows a problem based learning (PBL) model, and this approach was incorporated into the EM rotation. Each rotation group of nine students was divided into three smaller groups of three students, and each sub-group was assigned clinical shifts in the EC supervised by EM specialists or EM residents. They were encouraged to interview and examine patients, develop a differential diagnosis and management plan, present them to their supervisor, and be involved in procedures as they were available. Students kept logbooks of patients seen and procedures observed and performed. For

each case entered into the logbook, students developed learning objectives around that subject. For example, learning objectives around a "chest pain" presentation might involve listing the differential diagnosis, outlining the ECG findings associated with cardiac ischaemia, and describing the risk factors associated with coronary artery disease.

During each 10-week rotation, EM faculty and residents coordinated a PBL based curriculum covering 10 common emergency medicine topics. These were acute abdominal pain, altered mental status, wound care, simple fractures, chest pain, dyspnoea, seizures, sepsis, toxicology, and approach to trauma. Each week, students would meet together to present a case based on that week's assigned topic. They would determine learning objectives around that topic and then develop a plan to investigate the objectives over the course of the week. At the end of the week, they would meet with an EM faculty member or resident (PBL facilitator) to present their case and the outcomes of the learning objectives. The PBL facilitator would comment on the presentations and provide a formal, standardized PowerPoint lecture on the topic. During the course of the year, EM faculty also coordinated workshops on suturing and plaster application for all third year students.

After completing all four rotations, all 36 third-year students came together for a 4-week block of lectures. A survey was administered to them at that time to evaluate their emergency medicine learning experience.

A 10-week EM experience is an uncommon feature in medical education in the developing world. In countries with established emergency medicine systems, most undergraduate EM education is usually performed in the final years of medical school.[1] UBSOM EM faculty developed a simple survey to record and analyse the experiences of these students as they participated in this innovative rotation undertaken over their first year of clinical training. The aim of the survey was to record the students' impressions of emergency medicine and the effectiveness of the PBL approach, log books, and procedure training. It was hoped that exposure to acute clinical presentations in an emergency department setting early in their undergraduate training would positively affect their understanding of patient care.

Methods

After analysing the key objectives for the EM curriculum, a written survey of 22 questions was generated. The questions used a 5-point Likert scale with the options of "strongly disagree, disagree, neutral, agree, and strongly agree." These questions covered organization of the rotation and the students' learning and clinical decision-making experiences. The survey also included a list of common EM procedures and students selected which ones they had observed and/or performed. The final section contained four open-ended questions giving students an opportunity to comment on their experiences learning EM in Botswana.

Ethics approval was obtained from the University of Botswana Office of Research and Development prior to conducting the survey.

The survey was conducted during the common final block of lectures when all students were present. Students completed a consent form indicating that the survey was voluntary, anonymous, and would not affect their final grades. Results were entered and analysed in an excel spread sheet (Table 1 describes the survey questions).

Results

29 students out of 36 completed the entire survey (80.6% response rate), an additional 3 students left question 12 blank, and 2 students left question 13 blank. 94% (34/36) of the students completed some part of the study.

Responses to questions on the EM learning objectives were highly positive (see Fig. 1). 79% and 86% respectively strongly agreed or agreed that the learning objectives were both fair and achievable. 72% agreed or strongly agreed that the EM logbook was helpful during their rotation. Regarding the length of the rotation, 24% disagreed, 24% were neutral, and 31% agreed that 10 weeks were the appropriate time frame.

Fig. 2 outlines responses to questions regarding the style of learning in during the rotation. The EM learning experience was generally ranked highly agreeable to the students. Nearly 90% of the students agreed or strongly agreed that EM encouraged them to take their own initiative and over 90% agreed or strongly agreed that PBL and EM were an effective combination.

76% of those surveyed strongly agreed or agreed that their knowledge of basic medical sciences was enhanced by experience with EM; and 79% of students agreed or strongly agreed that they understood the core ED concept of triage.

Emergency departments around the world are notoriously stressful and fast paced environments, especially for students. Nevertheless, 66% of those surveyed agreed or strongly agreed that the EC was a good learning environment, with only 14% in strong disagreement.

There was an enthusiastic student response regarding procedural experiences gained during the EM rotation. 79% of students agreed or strongly agreed that they had opportunity to perform new procedures in this term.

22 different procedures were observed in the EC (Fig. 3) 100% saw venesection and plaster applications. Over 75% witnessed EM Ultrasound, chest compressions, venous cannulation, laceration repairs, urinary catheter insertions, fracture relocations and abscess incision and drainage. 14 procedures were performed by students, with 83% performing venesection and over 65% performing chest compressions and venous cannulation.

82% of students agreed or strongly agreed that 3rd year students should learn procedures in EC; but only 68% had the same responses to the statement that the procedures they performed were appropriate for their level of training. Even though many students wanted to learn procedures and felt it was appropriate, few among them felt confident, even when performing them under supervision.

Fig. 4 shows responses related to clinical decision making. Over 80% of students reported positive responses regarding improvements in patient care and confidence in clinical making. 72% of the students reported their EM rotation was a valuable component of their third year curriculum.

The next questions of the survey asked about students' perspective of EM in the future. It is interesting that although these third year students received 10 weeks of EM training 75% agreed or strongly agreed that they needed further training in EM before graduation in 2014.

Table 1 Survey questions.

The first questions ask about the organization of your EM rotation
1. The EM learning objectives were fair
2. The learning objectives for the EM were achievable
3. Using a patient logbook helped me with EM learning
4. 10 weeks is the correct length of time to learn EM in third year medicine

These questions are about your learning experience in Emergency Medicine
5. I was encouraged to take my own initiative in EM learning
6. Problem based learning using real cases from the hospital setting is an effective way to learn in the EC
7. Seeing patients in the EC enhanced my understanding of basic medical science concepts
8. The EC is a good environment for 3rd year medical students to learn
9. I understand the concept of triage when applied to patients presenting to the EC

These questions ask about the skills you learnt in EM
10. I had the opportunity to see many new procedures in my EM term
11. I had the opportunity to do new procedures in my EM term
12. The procedures I performed were appropriated for my level of training
13. I feel confident in performing the procedures I learnt in EM
14. Third year students should learn by performing procedures on patients in the EC

The next questions are about Clinical Decision Making in the EM
15. I feel confident about performing a history and physical exam, forming a differential diagnosis, and making an initial management plan for a stable patient presenting to the emergency department.
16. My clinical decision-making and diagnostic skills improved during my EM rotation
17. I was encouraged to ask questions in my EM term
18. Working with EC patients is a valuable experience for 3rd Year Medical students in Botswana
19. I need more EM training before I graduate as a doctor in Botswana
20. Before starting my EM rotation, I was interested in pursuing post-graduate training in EM in the future
21. After completing my EM rotation, I am interested in pursuing postgraduate EM training in the future
22. The key concepts and competencies of Emergency Medicine should be required knowledge for all doctors in Botswana

Final four "free text" questions
A1 How did your EM rotation affect your medical learning?
A2 What are the benefits and disadvantages of doing EM in 3rd year medicine?
A3 How would you improve the EM rotation for the next group of medical students?
A4 What were the key lessons you learnt in your EM rotation?
EM, emergency medicine; EC, emergency centre

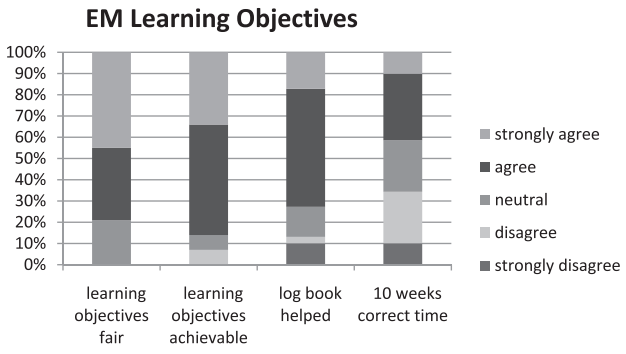

Figure 1 Student responses to questions on learning objectives in EM.

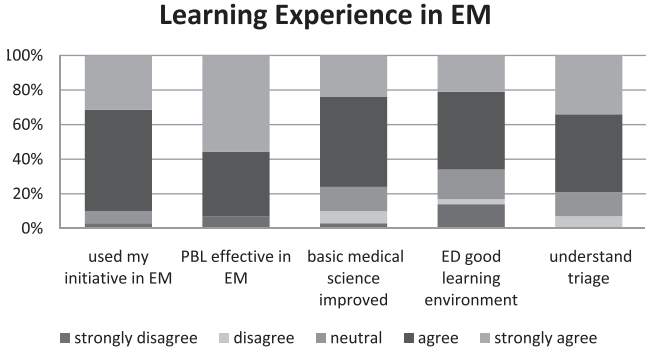

Figure 2 Student responses to questions about EM as a learning experience.

Students were divided about future training in EM in Botswana. The majority of them were not interested in EM post-graduate training in Botswana before doing EM but after the rotation the majority stated they would consider a future EM experience. The last question in the survey had the highest agreement for the entire survey. Ninety-three percent strongly agreed or agreed that EM was a core competency for all doctors in Botswana.

The final section of the survey had four questions for free written responses. These responses provided a good summary of the third year EM experience. Many students described how their EM rotation broadened their clinical medicine experience with varied presentations of common diseases. Seeing undifferentiated patients presenting with only a chief complaint (rather than a final diagnosis) they remarked on the relevance of the history and physical examination. Many students commented

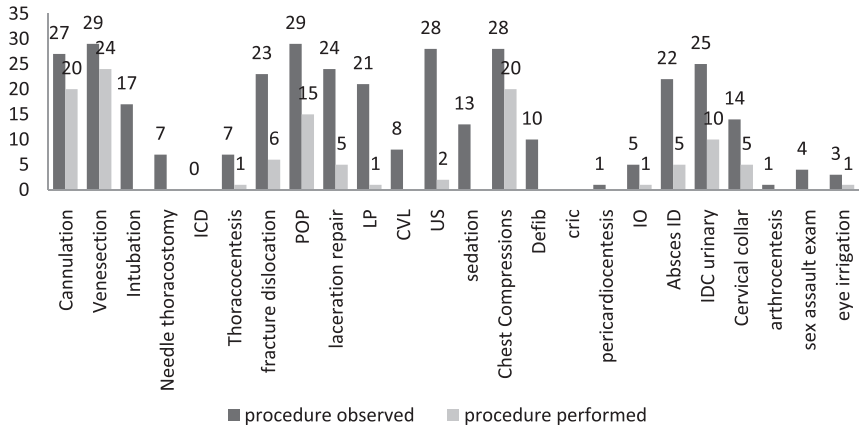

Figure 3 Procedures performed and observed.

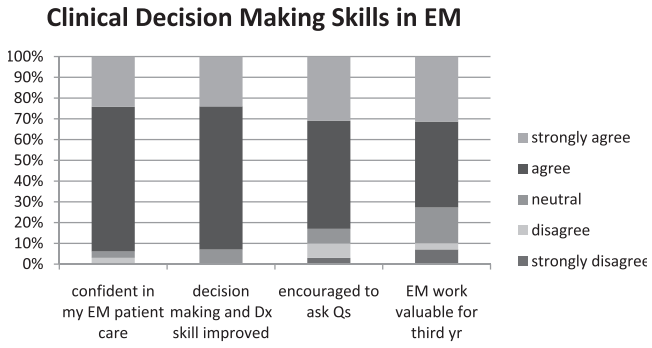

Figure 4 Clinical decision making.

that they liked the case presentation and management style of EM practice.

When asked about the advantages and disadvantages of doing EM in their third year, many students responded that rotation provided an opportunity to learn procedures (7 responses) and to be exposed to unique clinical scenarios (4 responses). Others responded that the EM rotation was interesting and fast-paced. Students remarked that the rotation was "never boring" and that they were excited to see patient resuscitations: "I saw CPR!"

The major disadvantage listed was that they felt they did not have enough clinical knowledge to benefit from their experiences, with a few requesting that EM be moved to a later phase of clinical training. A few had negative opinions of work in the EC, writing that staff were "too busy to ask questions" and that experience was "traumatic at first."

Despite the few main disadvantages described, the most commonly used word was "more" when asked about future methods of EM training. Ten out of the 29 responses requested more procedural training, and many requested more supervision, more bedside teaching, and two students even asked for more shifts.

When asked to outline the main lessons learned from their EM rotation, 11 described the Airway, Breathing, and Circulation (ABC) approach. Six described the importance of triage and the concept of excluding life-threatening conditions first.

Discussion

These results are encouraging for EM and PBL in Botswana. The survey revealed that the students had a positive outlook on the organization and learning objectives of their EM rotation. Following their EM experience, more than 90% of students supported the PBL approach and felt more confident in their decision making in clinical settings.

Undergraduate EM is a relatively new part of most medical school curricula, but is rapidly increasing worldwide. In 2004 a survey of 125 US medical schools found that over 58% gave medical students exposure to EM in 3rd year; 96% gave exposure to EM in 4th year and 53% had EM rotations/teaching in both 3rd and 4th years.[1] Several Australian undergraduate EM programs have been described with logbooks, an emphasis on problem based learning and feedback opportunities from students.[2] South Africa has also recently developed EM undergraduate and postgraduate training.[3]

There are little data differentiating or advocating better EM teaching at third year as opposed to fourth year[4] but many studies and curriculum papers recognize the advantage of fourth year students having more clinical experience and knowledge. Our students were also divided over the timeframe (10 weeks) and timing (during the 3rd year) of the EM experience, but highly enthusiastic in keeping EM in the undergraduate curriculum with more than 90% agreeing EM should be a core competency for all doctors in Botswana.

Some EM academics in the US have questioned why undergraduate EM rotations are not more popular, as postgraduate EM training is highly competitive and Emergency Departments are highly beneficial and comprehensive learning environments.[5,6] Several components of the EM curriculum model are unique to the specialty; including toxicology, forensics, and environmental medicine, so foregoing an EM rotation could lead to important knowledge gaps. EM rotations also provide a 'window' into the wider health system, especially aspects of pre-hospital care. EM faculty and staff can teach and model effective team approaches to health delivery, as well as demonstrate diplomatic and leadership skills in a clinical setting.

A small study in Australia showed EM rotations increased students' clinical management knowledge and confidence in their abilities and skills, but they overwhelmingly wanted more structured teaching. Students preferred practical, interactive, case-based and problem-based teaching.[2] Other studies have

shown the use of PBL and student presentations, especially with EM Faculty member presence, increases student discussion and encourages feedback and evaluation over the course of the rotation.[7] Our study agreed with these findings.

Procedural training has also become a challenge of medical education in recent years. A US study in 2005 looked at procedural skills attained by medical students in 7 medical schools and found that they were deficient in many procedural skills. 20% of the medical students in their final year had never performed phlebotomy or intravenous cannulation and the majority had never performed CPR.[8] In a recently published US study of over 200 4th year medical students in EM rotations, students rated significantly greater confidence with assessment, diagnosis, and management of the acutely ill patient after completion of their EM rotation; and they specifically reported increased confidence in procedural skills.[9] In our survey UB students stated they performed a wide range of procedures during their EM rotation, agreed that the procedures were appropriate for their level, and reported increased confidence in their procedural skills. There were over 20 different procedures observed and 100% of the students performed venesection and application of plaster in their first year of clinical exposure.

EM is a relatively new specialization and EM specialists are particularly interested in promoting their specialty and encouraging undergraduates to pursue future EM training. Many EM rotation feedback surveys in the US have not demonstrated a correlation with choice of EM as a career after medical school with increasing EM undergraduate exposure.[1,9] This survey revealed an increased interest in post-graduate EM training, an encouraging finding since postgraduate EM training is also in its infancy in Botswana.

Conclusions

The International Federation for Emergency Medicine (IFEM) has stated, "Society has a right to expect that at the completion of their undergraduate medical school training all physicians possess the basic knowledge of emergency care and the skills to manage common acute problems."[10] Undergraduate EM rotations provide an ideal environment for medical students to develop into well-rounded, independent practitioners. This is even more important in the sub-Saharan African environment where they must learn to make time sensitive decisions for undifferentiated patients with limited information, investigations and diagnostic resources.

Our survey demonstrated that these future medical practitioners of Botswana were able to learn EM in a challenging environment, enjoyed their EM experience and gained confidence in procedural, diagnostic and management skills.

Conflict of interest statement

Dr Megan Cox is currently the Emergency Medicine Clinical Lecturer at University of Botswana, where this study was performed. She has no conflict of interest. Dr Amit Chandra has no conflict of interest.

Contribution

MC wrote the survey, obtained ethics approval, researched the topics for discussion, formulated the results and wrote the article. AC edited the survey and the article and supervised the survey administration.

Appendix A. Short answer questions

Test your understanding of the contents of this original paper (answers can be found at the end of the regular feature section)

1. This study results suggest
   a. All medical students should be exposed to Emergency Medicine.
   b. Emergency Medicine is best taught at an early stage in medical school.
   c. Emergency Medicine has unique aspects to medicine, invaluable to students.
   d. Emergency medicine teaching does not require a structured curriculum.
   e. Medical students only require exposure to procedures in Emergency Medicine.

2. An emergency medicine rotation for medical students.
   a. Was found to be too difficult and too stressful.
   b. Was favourably received by the students surveyed.
   c. Was considered inappropriate for third year medical students.
   d. Was discouraged by the authors
   e. Was compatible with a problem based learning curriculum.

3. Which of the following are correct regarding procedures performed by medical students during their emergency medicine rotations.
   a. Over 20 types observed and 14 types performed.
   b. 100% of students performed CPR.
   c. 100% of students completed their rotation feeling confident about procedures.
   d. Students found procedural training to be beneficial to learning.
   e. Students preferred not to learn procedures during their clinical rotations.

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